

## Description

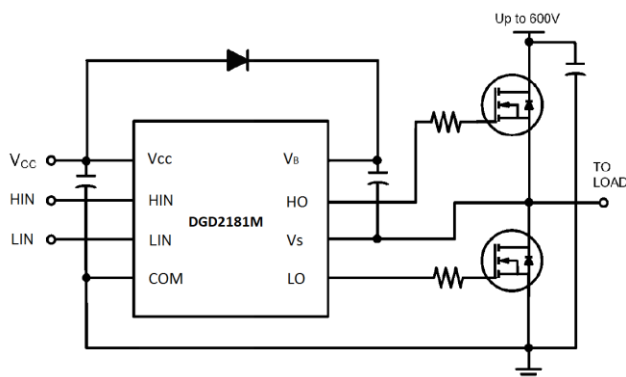
The DGD2181M is a high-voltage / high-speed gate driver capable of driving N-Channel MOSFETs and IGBTs in a half-bridge configuration. High-voltage processing techniques enable the DGD2181M's high-side to switch to 600V in a bootstrap operation.

The DGD2181M logic inputs are compatible with standard TTL and CMOS levels (down to 3.3V) for easy interfacing with controlling devices. The driver outputs feature high-pulse current buffers designed for minimum driver cross conduction.

The DGD2181M is offered in SO-8 (Type TH) package and the operating temperature extends from -40°C to +125°C.

## Applications

- DC-DC Converters
- DC-AC Inverters
- AC-DC Power Supplies
- Motor Controls
- Class D Power Amplifiers



Typical Configuration

## Features

- Floating High-side Driver in Bootstrap Operation to 600V
- Drives Two N-Channel MOSFETs or IGBTs in a Half Bridge Configuration
- 1.9A Source / 2.3A Sink Output Current Capability
- Outputs Tolerant to Negative Transients
- Wide Low-side Gate Driver and Logic Supply: 10V to 20V
- Logic Input (HIN and LIN) 3.3V Capability
- Schmitt Triggered Logic Inputs with Internal Pull Down
- Undervoltage Lockout for High and Low Side Drivers
- Extended Temperature Range: -40°C to +125°C
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Mechanical Data

- Case: SO-8 (Type TH)
- Case Material: Molded Plastic. "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 3 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads. Solderable per MIL-STD-202, Method 208②
- Weight: 0.075 grams (Approximate)

SO-8 (Type TH)



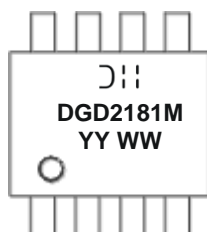
Top View

## Ordering Information (Note 4)

Part Number	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
DGD2181MS8-13	DGD2181M	13	12	2,500

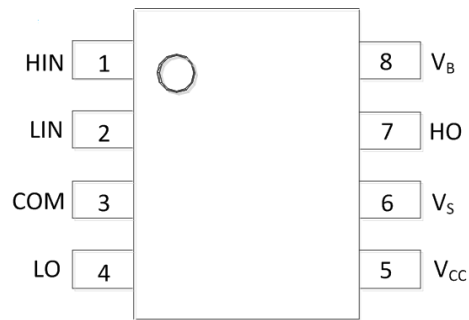
- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



DII = Manufacturer's Marking  
 DGD2181M = Product Type Marking Code  
 YY = Year (ex: 18 = 2018)  
 WW = Week (01 to 53)

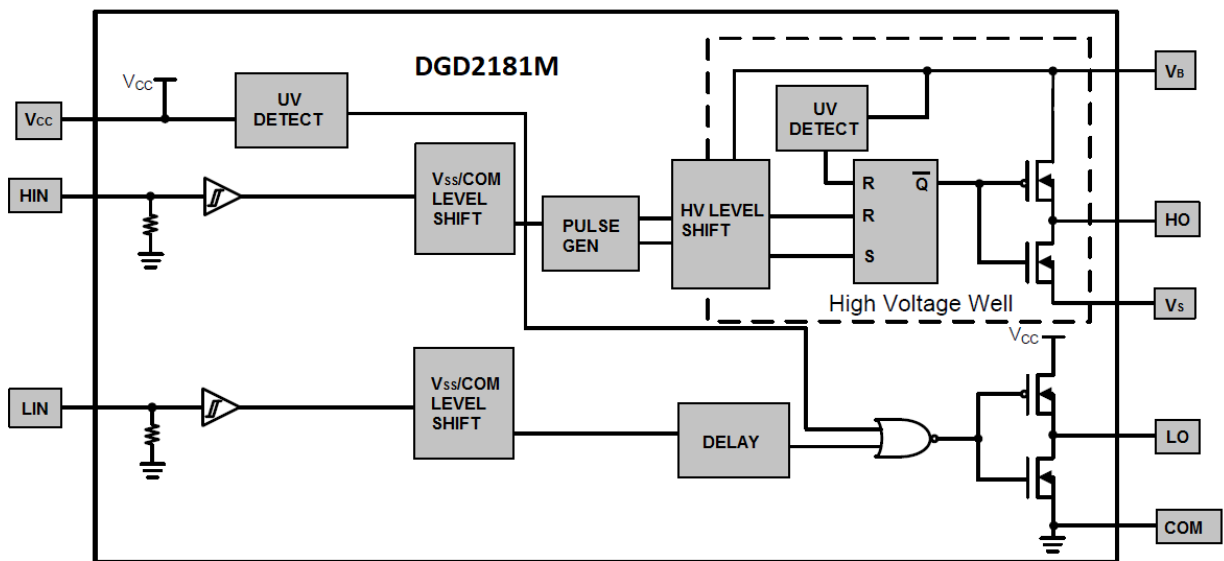
## Pin Diagrams



## Pin Descriptions

Pin Number	Pin Name	Function
1	HIN	Logic input for high-side gate driver output, in phase with HO
2	LIN	Logic input for low-side gate driver output, in phase with LO
3	COM	Low-side and logic return
4	LO	Low-side gate drive output
5	V <sub>CC</sub>	Low-side and logic fixed supply
6	V <sub>S</sub>	High-side floating supply return
7	HO	High-side gate drive output
8	V <sub>B</sub>	High-side floating supply

## Functional Block Diagram



## Absolute Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
High-side Floating Supply Voltage	V <sub>B</sub>	-0.3 to +624	V
High-side Floating Supply Offset Voltage	V <sub>S</sub>	V <sub>B</sub> -24 to V <sub>B</sub> +0.3	V
High-side Floating Output Voltage	V <sub>HO</sub>	V <sub>S</sub> -0.3 to V <sub>B</sub> +0.3	V
Offset Supply Voltage Transient	dV <sub>S</sub> / dt	50	V/ns
Low-side Fixed Supply Voltage	V <sub>CC</sub>	-0.3 to +24	V
Low-side Output Voltage	V <sub>LO</sub>	-0.3 to V <sub>CC</sub> +0.3	V
Logic Input Voltage (HIN and LIN)	V <sub>IN</sub>	-0.3 to V <sub>CC</sub> +0.3	V

## Thermal Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Power Dissipation Linear Derating Factor (Note 5)	P <sub>D</sub>	0.625	W
Thermal Resistance, Junction to Ambient (Note 5)	R <sub>θJA</sub>	200	°C/W
Operating Temperature	T <sub>J</sub>	+150	°C
Lead Temperature (Soldering, 10s)	T <sub>L</sub>	+300	
Storage Temperature Range	T <sub>STG</sub>	-55 to +150	

Note: 5. When mounted on a standard JEDEC 2-layer FR-4 board.

## Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
High-side Floating Supply Absolute Voltage	V <sub>B</sub>	V <sub>S</sub> + 10	V <sub>S</sub> + 20	V
High-side Floating Supply Offset Voltage	V <sub>S</sub>	(Note 6)	600	V
High-side Floating Output Voltage	V <sub>HO</sub>	V <sub>S</sub>	V <sub>B</sub>	V
Low-side Fixed Supply Voltage	V <sub>CC</sub>	10	20	V
Low-side Output Voltage	V <sub>LO</sub>	0	V <sub>CC</sub>	V
Logic Input Voltage (HIN and LIN)	V <sub>IN</sub>	0	5	V
Ambient Temperature	T <sub>A</sub>	-40	+125	°C

Note: 6. Logic operation for V<sub>S</sub> of -5V to +600V.

**DC Electrical Characteristics** ( $V_{BIAS}$  ( $V_{CC}$ ,  $V_{BS}$ ) = 15V, @ $T_A$  = +25°C, unless otherwise specified.) (Note 7)

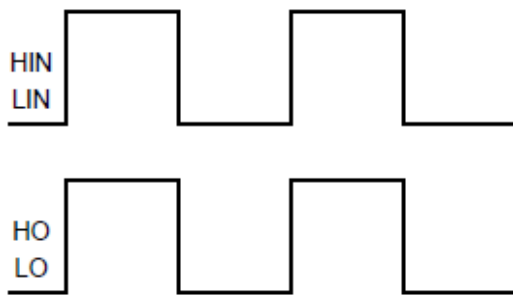
Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Logic "1" Input Voltage	$V_{IH}$	2.5	—	—	V	$V_{CC}$ = 10V to 20V
Logic "0" Input Voltage	$V_{IL}$	—	—	0.8	V	$V_{CC}$ = 10V to 20V
High Level Output Voltage, $V_{BIAS} - V_O$	$V_{OH}$	—	—	1.4	V	$I_O$ = 0mA
Low Level Output Voltage, $V_O$	$V_{OL}$	—	—	0.2	V	$I_O$ = 20mA
Offset Supply Leakage Current	$I_{LK}$	—	—	50	$\mu$ A	$V_B = V_S = 600V$
Quiescent $V_{BS}$ Supply Current	$I_{BSQ}$	20	60	150	$\mu$ A	$V_{IN}$ = 0V or 5V
Quiescent $V_{CC}$ Supply Current	$I_{CCQ}$	50	120	240	$\mu$ A	$V_{IN}$ = 0V or 5V
Logic "1" Input Bias Current	$I_{IN+}$	—	25	60	$\mu$ A	$V_{IN}$ = 5V
Logic "0" Input Bias Current	$I_{IN-}$	—	—	5.0	$\mu$ A	$V_{IN}$ = 0V
$V_{BS}$ Supply Undervoltage Positive Going Threshold	$V_{BSUV+}$	8.0	8.9	9.8	V	—
$V_{BS}$ Supply Undervoltage Negative Going Threshold	$V_{BSUV-}$	7.4	8.2	9.0	V	—
$V_{CC}$ Supply Undervoltage Positive Going Threshold	$V_{CCUV+}$	8.0	8.9	9.8	V	—
$V_{CC}$ Supply Undervoltage Negative Going Threshold	$V_{CCUV-}$	7.4	8.2	9.0	V	—
Output High Short Circuit Pulsed Current	$I_{O+}$	1.4	1.9	—	A	$V_O$ = 0V, $PW \leq 10\mu s$
Output Low Short Circuit Pulsed Current	$I_{O-}$	1.7	2.3	—	A	$V_O$ = 15V, $PW \leq 10\mu s$

Note: 7. The  $V_{IN}$  and  $I_{IN}$  parameters are applicable to the two logic input pins: LIN and HIN. The  $V_O$  and  $I_O$  parameters are applicable to the respective output pins: HO and LO.

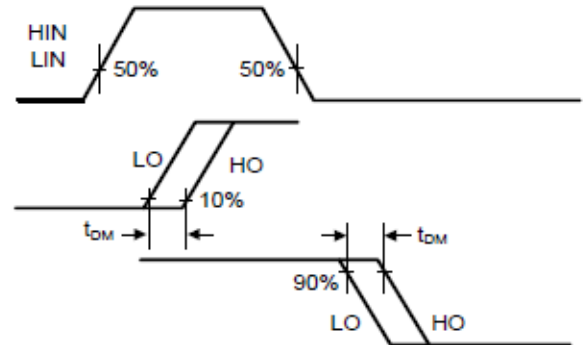
**AC Electrical Characteristics** ( $V_{BIAS}$  ( $V_{CC}$ ,  $V_{BS}$ ) = 15V,  $C_L$  = 1000pF, @ $T_A$  = +25°C, unless otherwise specified.)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Turn-on Propagation Delay	$t_{ON}$	—	180	270	ns	$V_S$ = 0V
Turn-off Propagation Delay	$t_{OFF}$	—	220	330	ns	$V_S$ = 0V or 600V
Delay Matching, HO & LO Turn-On/Off	$t_{DM}$	—	—	35	ns	—
Turn-on Rise Time	$t_R$	—	40	60	ns	$V_S$ = 0V
Turn-off Fall Time	$t_F$	—	20	35	ns	$V_S$ = 0V

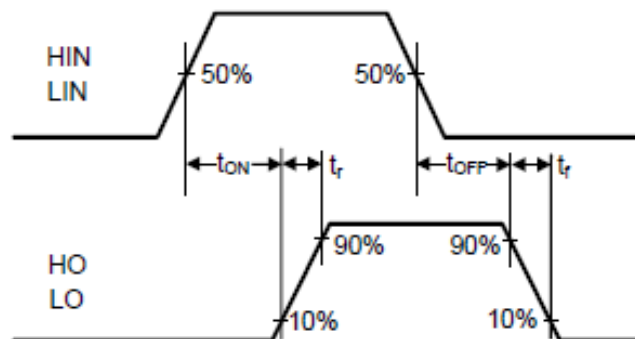
## Timing Waveforms



**Figure 1.** Input / Output Timing Diagram



**Figure 2.** Delay Matching Waveform Definitions



**Figure 3.** Switching Time Waveform Definitions

# Typical Performance Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

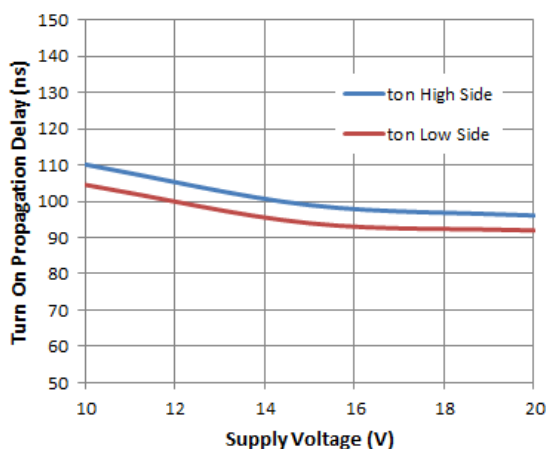


Figure 4. Turn-on Propagation Delay vs. Supply Voltage

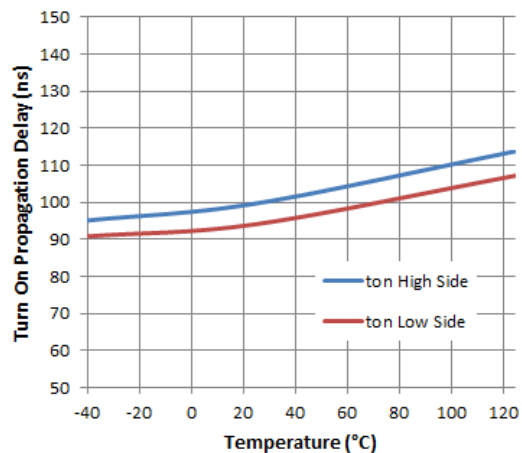


Figure 5. Turn-on Propagation Delay vs. Temperature

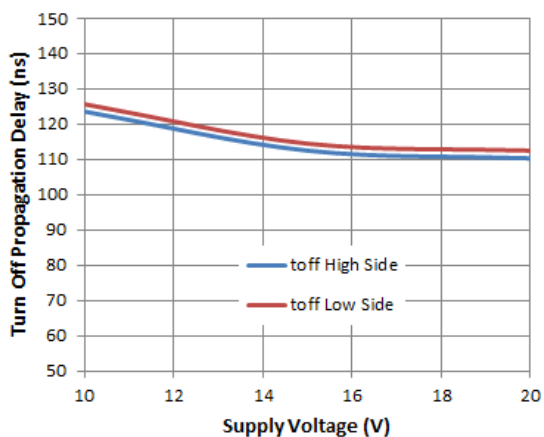


Figure 6. Turn-off Propagation Delay vs. Supply Voltage

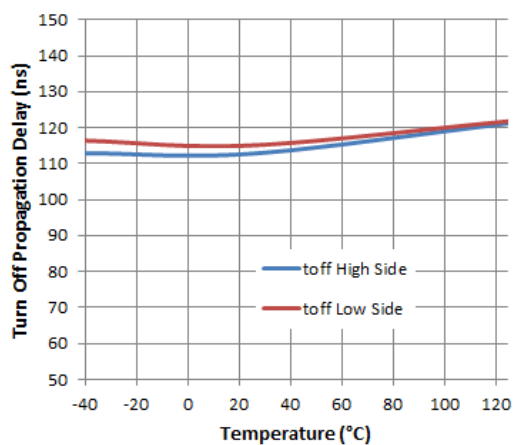


Figure 7. Turn-off Propagation Delay vs. Temperature

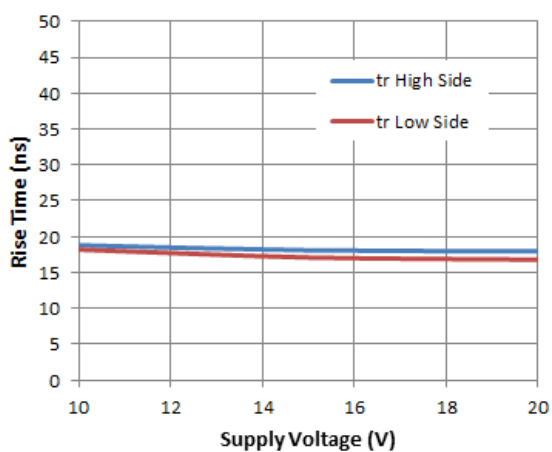


Figure 8. Rise Time vs. Supply Voltage

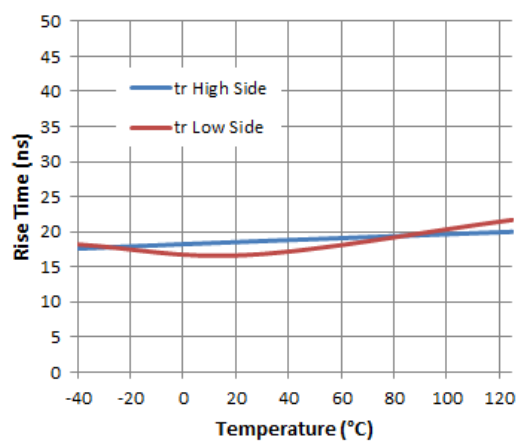


Figure 9. Rise Time vs. Temperature

## Typical Performance Characteristics (Cont.)

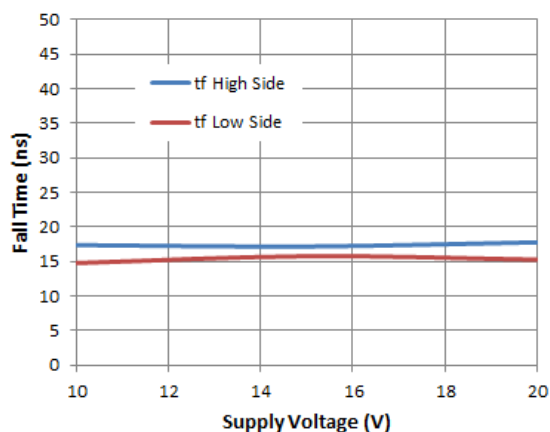


Figure 10. Fall Time vs. Supply Voltage

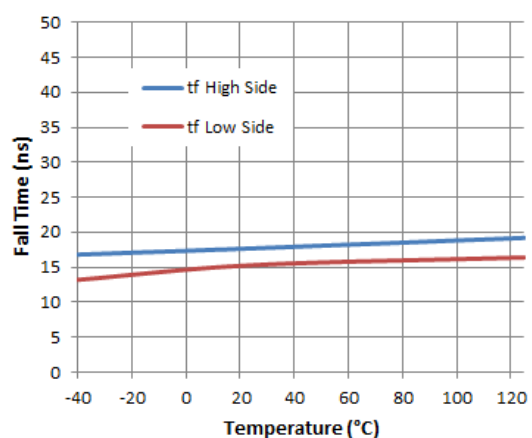


Figure 11. Fall Time vs. Temperature

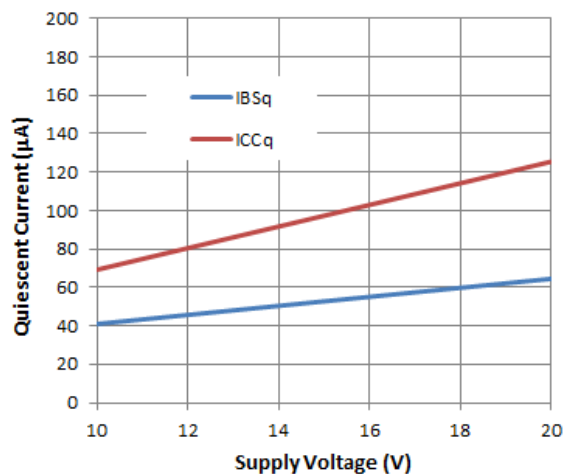


Figure 12. Quiescent Current vs. Supply Voltage

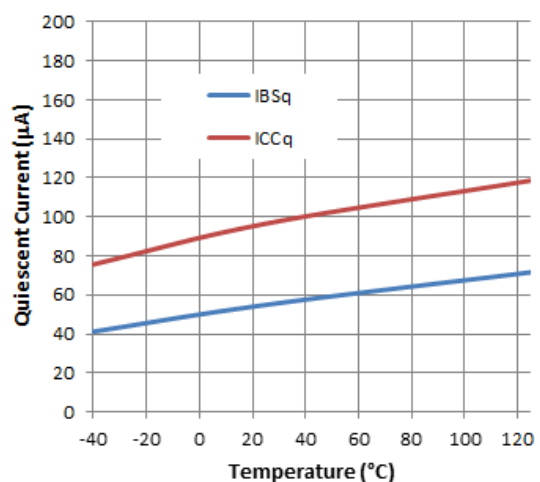


Figure 13. Quiescent Current vs. Temperature

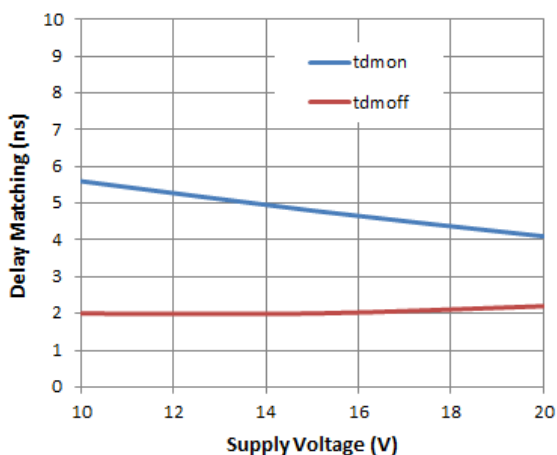


Figure 14. Delay Matching vs. Supply Voltage

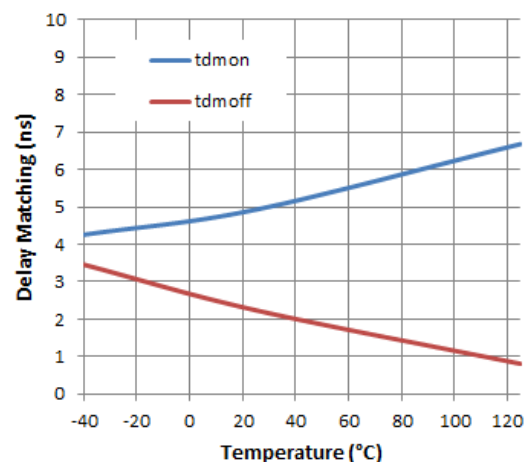
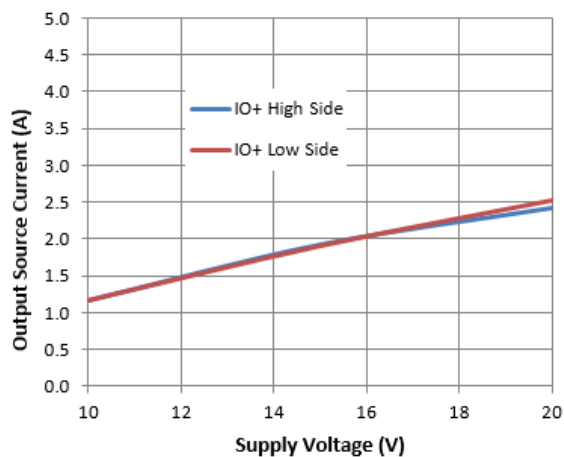
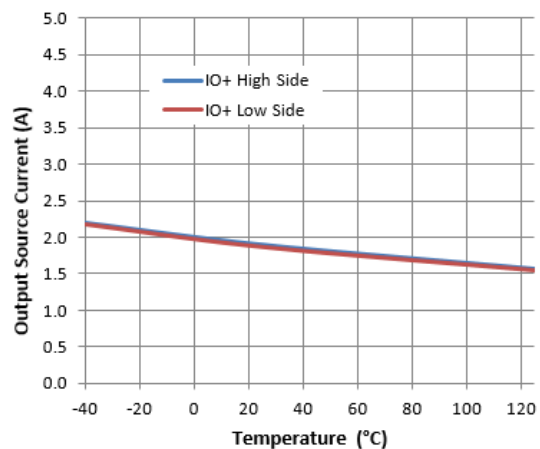


Figure 15. Delay Matching vs. Temperature

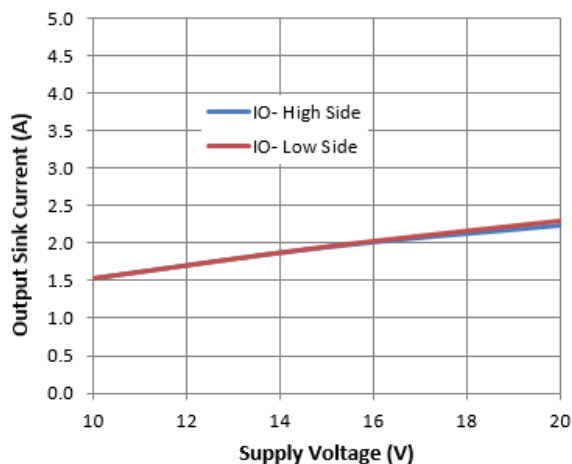
## Typical Performance Characteristics (Cont.)



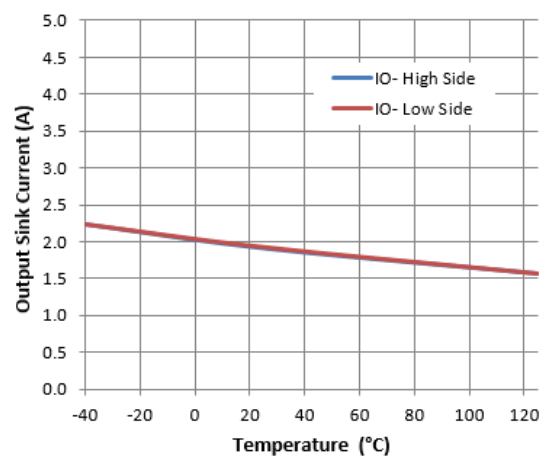
**Figure 16.** Output Source Current vs. Supply Voltage



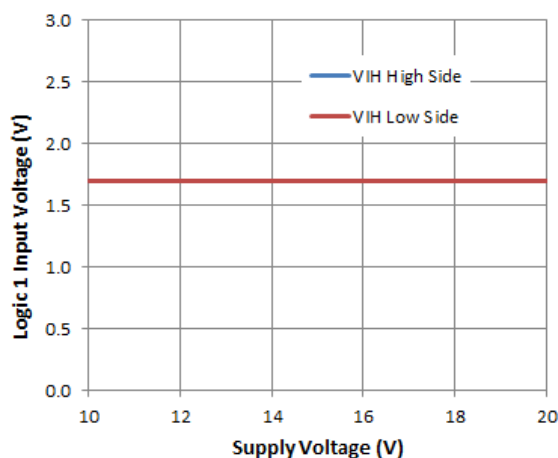
**Figure 17.** Output Source Current vs. Temperature



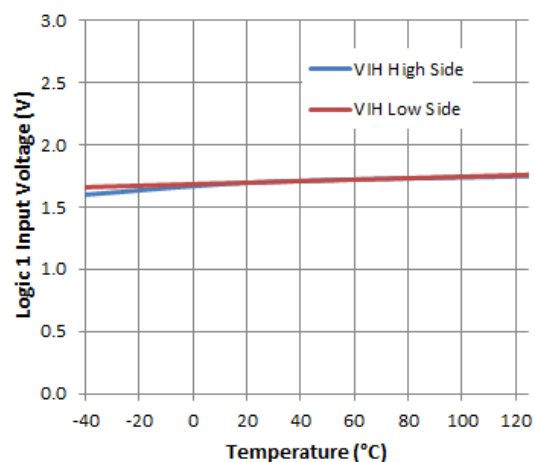
**Figure 18.** Output Sink Current vs. Supply Voltage



**Figure 19.** Output Sink Current vs. Temperature



**Figure 20.** Logic 1 Input Voltage vs. Supply Voltage



**Figure 21.** Logic 1 Input Voltage vs. Temperature



## Typical Performance Characteristics (Cont.)

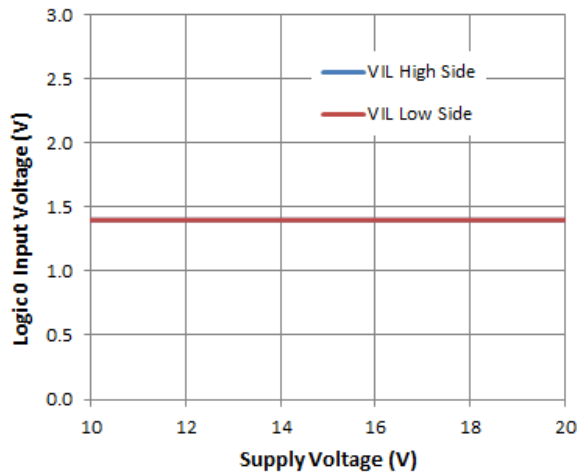


Figure 22. Logic 0 Input Voltage vs. Supply Voltage

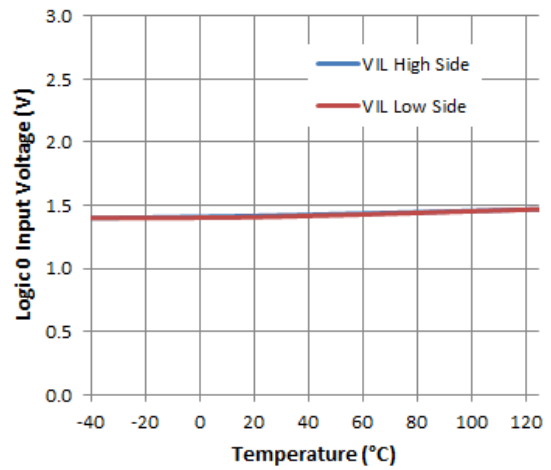


Figure 23. Logic 0 Input Voltage vs. Temperature

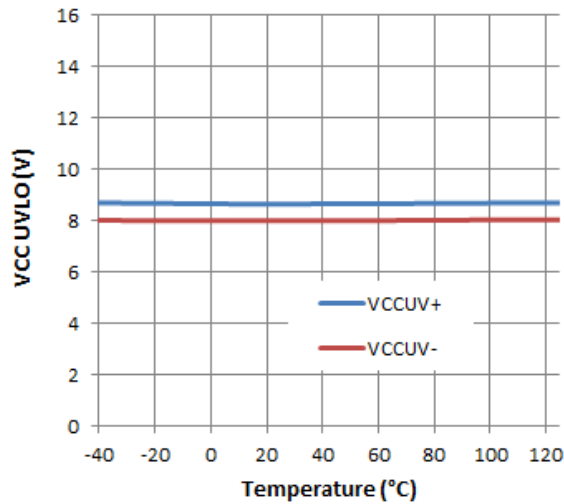


Figure 24. VCC UVLO vs. Temperature

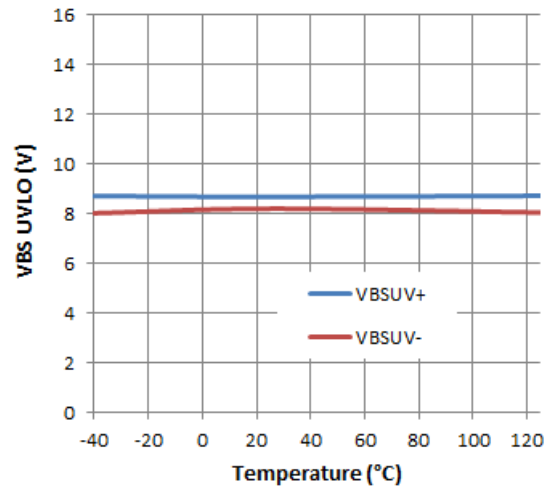


Figure 25. VBS UVLO vs. Temperature

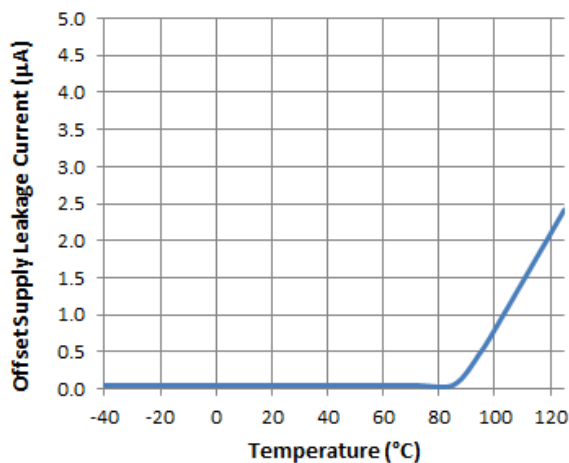
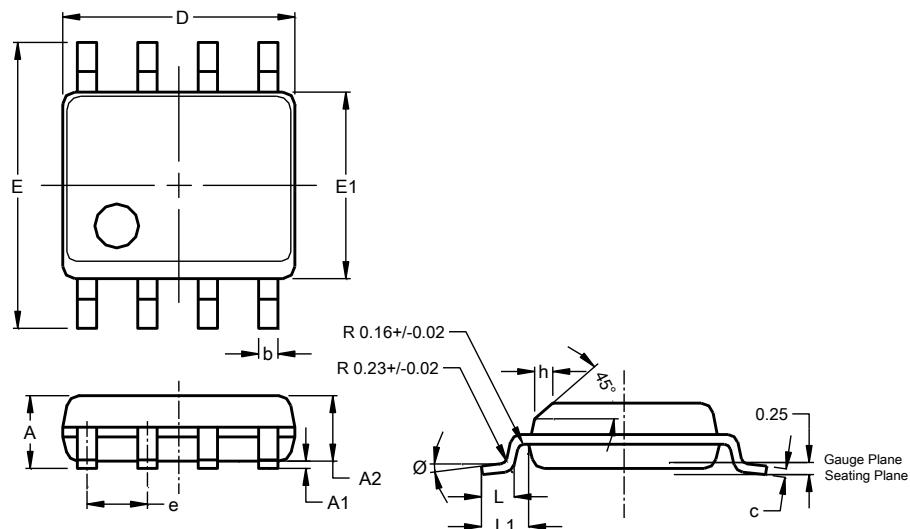


Figure 26. Offset Supply Leakage Current vs. Temperature

## Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### SO-8 (Type TH)

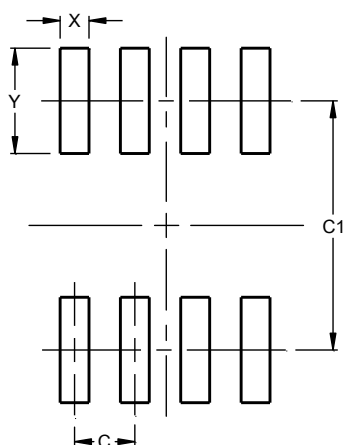


SO-8 (Type TH)			
Dim	Min	Max	Typ
A	1.35	1.75	--
A1	0.10	0.25	--
A2	--	--	1.45
b	0.35	0.51	--
c	0.190	0.248	--
D	4.80	5.00	4.90
E	5.80	6.20	6.00
E1	3.80	4.00	3.90
e	--	--	1.27
h	0.25	0.50	--
L	0.41	1.27	--
L1	--	--	1.04
Ø	0°	8°	--
All Dimensions in mm			

## Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

### SO-8 (Type TH)



Dimensions	Value (in mm)
C	1.27
C1	5.20
X	0.60
Y	2.20

Note: For high voltage applications, the appropriate industry sector guidelines should be considered with regards to creepage and clearance distances between device Terminals and PCB tracking.

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